3-703.6

B- 865

RECYCLING METHODOLOGY PUBLIC WORKSHOP

Fernald Environmental Management Project

July 8, 1997, 7 p.m., Alpha Building

AGENDA

7 p.m.	**OPENING REMARKS**	Gary Stegner, DOE FEMP
7:05 p.m.	**RECAP OF PUBLIC INVOLVEMENT**	Pete Yerace, DOE FEMP
7:10 p.m.	**SUMMARY OF CHANGES TO METHODOLOGY**	Pete Yerace
7:25 p.m.	**CASE STUDIES**	Bob Lehrter, Fluor Daniel Fernald
	-- Plant 4 case study based on current data -- Plant 4 hypothetical case study based on test data -- Plant 4 hypothetical case study decision phase	Kathy Yuracko, Lockheed Martin Energy Systems, ORNL
	-- Mill Rolls	
8:25 p.m.	**FUTURE APPLICATIONS OF METHODOLOGY**	Bob Lehrter
	– D&D Implementation Plans – Other Potential Material Categories	
8:45 p.m.	**FREE RELEASE**	Pete Yerace
8:55 p.m.	**PATH FORWARD**	Pete Yerace
9 p.m.	**ADJOURN**	

WORKSHOP OBJECTIVES

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- Explain the changes to the Recycling Methodology
- Present the results of the Plant 4 Case Study
- Demonstrate how the Recycling Methodology and the decision process will be applied utilizing a hypothetical case study
- Obtain any final stakeholder comments on the Recycling Methodology
- Continue discussion on free release

PUBLIC INVOLVEMENT OPPORTUNITIES

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- April 23, 1996, OU3 Proposed Plan Public Meeting
- June 11, 1996, Recycling Public Workshop
- Draft Recycling Methodology public review June 11 - July 26
- November 7, 1996, Recycling Methodology & Plant 4 Case Study Public Workshop
- Draft Plant 4 Case Study public review November 7 - December 1
- January 9 Fernald Citizens Task Force Environmental Monitoring (EM) Subcommittee Meeting
- January 11 Task Force Meeting
- May 21 Task Force EM Subcommittee Meeting
- Draft Final Recycling Methodology public review May 12 - July 8 -- PEIC & Internet
- July 8 Recycling Methodology Public Workshop

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SUMMARY OF CHANGES TO RECYCLING METHODOLOGY

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- Added a threshold phase
- Removed Envirocare and NTS as disposal alternatives
- Better defined the scoring process for subjective performance measures
- Standardized weighting factors for each performance measure
- Simplified and reduced the volume of the document by 50 percent

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PLANT 4 CASE STUDY
TOTAL COST CROSSOVER POINTS

FERNALD

1,500 Tons Scenario

Alternative	Total Cost	% Over Lowest	OSDF Cost to Reach Crossover
OSDF	$ 92 K		
FEMP MRF	$ 800 K	770%	$ 640 K
Vendor MRF	$ 3.3 M	3,490%	$ 2.6 M
"Recycle 2000"	$ 3.6 M	3,810%	$ 2.9 M
Privatized FEMP MRF	$ 1.7 M	1,750%	$ 1.4 M

OSDF: Onsite Disposal Facility
MRF: Material Release Facility

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STANDARDIZED WEIGHTING FACTORS (WT.%)

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Performance Measure	Weight %
Total Cost	10
Schedule Impacts	15
Local Economic Impacts	5
Institutional Preference	15
Local Social Preference	30
Environmental Impact	25
	Total = 100%

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PLANT 4 HYPOTHETICAL CASE STUDY DECISION SUMMARY MATRIX

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1,500 Tons Scenario (based on test data)

PERFORMANCE MEASURES		Alternatives				
		1) OSDF * (OU3 ROD Remedy)	2) FEMP MRF	3) Vendor MRF	4) Recycle 2000	5) Privatized FEMP MRF
Total Cost	NPV/LCC	$ 640 K	800 K	3.3 M	3.6 M	1.7 M
	Unit	105 $/bcf	133	537	588	275
Schedule Impacts		2.5 yrs.	2 yrs.	1.5 yrs.	1 yrs.	1.5 yrs.
Local Economic Impacts		3	3	3	3	3
Institutional Preference		2	4	5	5	5
Local Social Preference		1	4	4	5	4
Environmental Impact		1	5	5	5	5

* Per the OU3 final ROD, the selected final remedial action for disposition of the majority of FEMP OU3 radiologically contaminated material, including scrap structural steel, is placement in the OSDF.

bcf: bank cubic feet
MRF: Material Release Facility
NPV/LCC: Net Present Value/Life Cycle Cost

DEMONSTRATION EXAMPLE

Input data:

Performance Measures	Alternatives: OSDF	Alternatives: FEMP MRF	Weighting Factors
NPV	640,000	800,000	10
Schedule	2.5	2	15
Local Economic Impacts	3	3	5
Institutional Preference	2	4	15
Local Social Preference	1	4	30
Environmental Impact	1	5	25

Normalize the scores:

Performance Measures	Alternatives: OSDF	Alternatives: FEMP MRF	Weighting Factors
NPV	1	0	10
Schedule	0	1	15
Local Economic Impacts	0.5	0.5	5
Institutional Preference	0.25	0.75	15
Local Social Preference	0	0.75	30
Environmental Impact	0	1	25

Overall score for OSDF =

$$10(1) + 15(0) + 5(0.5) + 15(0.25) + 30(0) + 25(0) = 16$$

Overall score for FEMP MRF =

$$10(0) + 15(1) + 5(0.5) + 15(0.75) + 30(0.75) + 25(1) = 76$$

MILL ROLLS (2.5 ft. diameter)

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MRF Cost	
Diameter (ft)	2.50
Length (ft)	5.00
Density (lbs/cubic ft)	490.00
Volume (cubic ft)	24.53
Weight (tons)	6.01
Surface area (sq ft)	49.06
Decon Rate (sq ft/man hour)	4.00
Labor Rate ($/hr)	$23.75
Additional indirect cost factor	1.3
Cost Per Ton	$63.01
Cost Per bcf	*$15.75*
Plus 25%	$19.69
Minus 25%	$11.81

OSDF Cost	
Cost Per Ton	$76.00
Cost Per bcf	*$19.00*
Plus 25%	$23.75
Minus 25%	$14.25

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MILL ROLLS (1 ft. diameter)

FERNALD

MRF Cost	
Diameter (ft)	1.00
Length (ft)	5.00
Density (lbs/cubic ft)	490.00
Volume (cubic ft)	3.93
Weight (tons)	0.96
Surface area (sq ft)	17.27
Decon Rate (sq ft/man hour)	4.00
Labor Rate ($/hr)	$23.75
Additional indirect cost factor	1.3
Cost Per Ton	$138.62
Cost Per bcf	*$34.66*
Plus 25%	$43.32
Minus 25%	$25.99

OSDF Cost	
Cost Per Ton	$76.00
Cost Per bcf	*$19.00*
Plus 25%	$23.75
Minus 25%	$14.25

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DECONTAMINATION & DISMANTLING (D&D) PROJECTS

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Past and Current D&D Projects

- Plant 4 Complex -- recycling decision addressed in Plant 4 Recycling Methodology Case Study
- Plant 1 Complex, Phase I; Boiler Plant/Water Plant Complex; Thorium/Plant 9 Complex
  - Implementation plans have been approved or submitted for review;
  - Recycling decisions will be based on extensive evaluation including the Recycling Methodology

DECONTAMINATION & DISMANTLING (D&D) PROJECTS

FERNALD

Future D&D Projects

- **Maintenance Complex, Tank Farm Complex & all future D&D projects**

  - **Each governing D&D implementation plan will include a decision whether materials will be recycled or released based on extensive evaluation including the Recycling Methodology**

OTHER POTENTIAL MATERIAL CATEGORIES FOR RECYCLING

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- Mill rolls
- Well casings (stainless & carbon steel)
- Copper ingots
- Galvanized pallets
- Plastic pallets

PATH FORWARD

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- Finalize the Recycling Methodology
- Apply the Recycling Methodology and incorporate in D&D implementation plans
- Plan roundtable discussion on free release
- Continue evaluation of materials for Recycling Methodology

Summary of Changes to the *Draft Final Decision Methodology for Fernald Material Disposition Alternatives*

The following changes were made to the *Decision Methodology for Fernald Material Disposition Alternatives* in an effort to simplify application of the methodology. Many of the changes (noted with an asterisk) were the result of stakeholder input.

- ***Added a threshold phase.*** The threshold criteria reflect DOE's commitment to incorporating certain core values, such as safety and health, in all FEMP activities. Therefore, the following three performance measures have been elevated to threshold criteria:

  1. Protectiveness of Human Health and the Environment
  2. Meets Applicable or Relevant and Appropriate Requirements (ARAR)
  3. Within 25 percent of the lowest cost alternative (Total Life Cycle Cost) * The lowest cost alternative, and any alternatives which are within 25 percent of the lowest cost alternative, will pass the threshold phase and be retained for evaluation in the Life Cycle Analysis Phase.

- ***Removed Envirocare and Nevada Test Site as disposal alternatives.*** Both disposal sites were thoroughly evaluated as part of the *Operable Unit 3 Record of Decision for Final Remedial Action.*

- ***Better defined the scoring process for subjective performance measures (local economic impacts, local social preferences, institutional preference and environmental impacts).*** DOE and EPA will now evaluate these performance measures based on technical data, and will develop definitions for ranking the measures on a constructed scale from 1 through 5 (5 is more preferable). DOE will continue to request stakeholder input on local social preferences only. This is in response to difficulties stakeholders experienced in scoring performance measures. *

- ***Standardized weighting factors for each performance measure.*** DOE took all stakeholder weights and constructed a standard weight percent based on the data for each performance measure. *

- ***Simplified and reduced the volume of the document by 50 percent so it is less complicated and more user friendly.*** *

Note: Per the *Operable Unit 3 Record of Decision for Final Remedial Action,* the selected final remedial action for the majority of OU3 radiologically contaminated material, including structural steel, is placement in the On-Site Disposal Facility.

May 6, 1997

FERNALD Environmental Management Project

FEMP Recycling, Waste Minimization and Pollution Prevention

JUNE 1997

Poly-Peanut Reuse

Packaging "peanuts" are separated from the boxes at RIMIA before they are broken down and transported to a local company for reuse. To date, approximately 107 bags of peanuts have been reused, with approximately 65 (32 gallon) bags produced yearly.

Material Release Facility (MRF)

The Material Release Facility has completed approximately 90 percent of the steel from the former Fire Training Facility. This involved the use of a vacuum grit blaster for the removal of radioactive contamination and lead based coatings. Next in line for the MRF is the decontamination of railroad tracks that were removed for the installation of the haul road within the former process area. There are approximately 350 feet of track available, with more steel becoming available as remediation efforts continue.

Acquisition of the soda blasting system is complete. O'Brien & Gere was on site in April to assemble, set up, and test the equipment. O'Brien & Gere also provided training to the MRF Hazwat crew, as well as appropriate maintenance crews.

Currently, 300 tons of scrap steel have been decontaminated using steam detergent spray and the vacuum grit blasting system at the MRF. About 85 percent of this has been sold to vendors and scrap dealers for recycling.

Copper Recycling

The engineering study awarded to MSC Inc., of Oak Ridge, Tenn., to size reduce and decontaminate approximately 30 tons of the 1,500 tons of copper on site is now complete. The study showed that the copper could be separated from its insulation, which is radiologically surface contaminated and contained asbestos. All the copper processed has been declared free releasable and is scheduled to be sold to a metal broker. The waste has been returned to the FEMP for disposal.

Green-Is-Clean

The FEMP is currently achieving 55 percent recovery rate of trash. Originally destined as low-level radioactive waste, by diverting it to a sanitary landfill. Cost savings to date are approximately $465,000. As of May 1997, a total of 86,602 cubic feet of trash had been diverted.

5992-12

RIMIA

Certain products received at RIMIA and destined for the contaminated area are removed from shipping packages and placed into reusable crates. The clean packaging is then recycled. To date, cost savings are approximately $64,693; a total of 6,502 cubic feet of clean packaging have been diverted.

Paper Recycling

The new contract for paper recycling is currently under way. To date the FEMP has recycled 590 tons of paper. In 1997, 45 tons of paper have been recycled as of the end of May.

Lead Acid Batteries

All lead acid batteries are recycled in Indianapolis. A total of 72,222 pounds have been recycled to date with a generation of over $2,600 revenue for FDF.

Used Tires

Plans to retread good casings are currently being examined. Tires that do not meet specifications will continue to be recycled. To date, over 400 tires have been recycled with Phoenix Recycling.

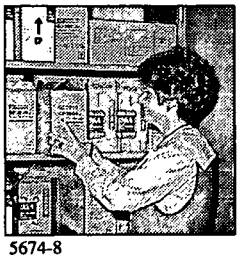
Aluminum Cans

The FEMP's aluminum cans are donated to Southwest and Ross Local Schools, scouts, and other area organizations, which recycle the cans and use the money for environmental projects. To date, the FEMP has recycled 57,712 pounds of aluminum cans.

Fluorescent Lights

In 1996, more than 9,200 pounds of lights and ballasts were recycled by a local vendor at a significant cost avoidance over disposal as mixed hazardous waste.

Laserjet Toner Cartridge Recycling

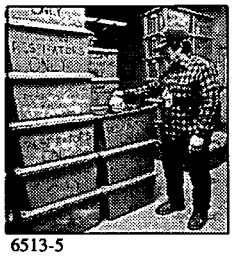

5674-8

At no cost to the FEMP, a local vendor accepts used cartridges and provides refurbished cartridges at a reduced rate. Annual cost savings are approximately $140,000; with over 6,600 units recycled to date.

Reusable Laundry Bags

In a selected facility, the FEMP has replaced disposable plastic bags with reusable laundry bags to collect used personal protective clothing from contamination areas. The project is currently in a test phase, with projected annual savings of $46,000 for site wide implementation.

Respirator Container Program

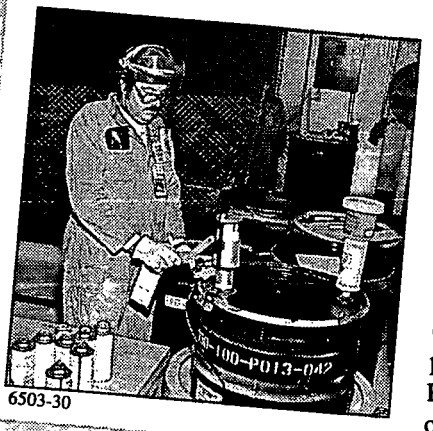

6513-5

In June, the FEMP implemented a program to replace cardboard boxes with plastic reusable containers to store and transport reconditioned respirators. This program has a projected annual savings of $20,000. To date, 333 cubic feet of waste have been avoided at a cost savings of $19,745.

Reuse Bulletin Board

The FEMP established this electronic bulletin board in the fall of 1995 to provide a mechanism for team members to advertise office items for reuse. To date cost savings are over $260,000. This program is in the process of being expanded to the other four Ohio Field Office locations as a part of a Pollution Prevention initiative.

Aerosol Can Puncturing Facility



6503-30

As part of a 97-1 POC (Performance Objective Criteria) to dispose of 100 drums of legacy aerosol cans, the Aerosol Can Puncturing Facility has been utilized to puncture over 6,000 cans. These cans have been sent to a local vendor to be recycled, while a remaining 1,500 cans that have been found to have surface contamination will be sent to NTS (Nevada Test Site) for disposal as Low Level Waste. An additional POC has been established for 97-2 to process 150 more drums from the stockpile.

Recycling Basic Ordering Agreements (BOA's)

The FEMP is evaluating proposals as a result of a solicitation for the establishment of Basic Ordering Agreement (BOA) subcontracts with multiple vendors. This program will provide decontamination and recycling services for scrap metals, including carbon steel, copper, lead, stainless steel, and nickel alloys.

Affirmative Procurement

Executive Order 12873 requires federal agencies to purchase EPA-designated items containing recycled contents.

Use of the new P-Card Solutions software has enabled waste minimization personnel to more closely track affirmative procurement purchases for compliance and reporting purposes. Additional management support and awareness programs for the implementation of the regulations will be issued this summer.

Waste Reduction Technologies Demonstration Project

Beginning in August, FDF's Waste Minimization and Technology Programs will be working in conjunction on a pilot project with Waste Reduction Technologies Inc. of Covington, Ky. This process uses a low pressure rotary steam vessel to volumetrically reduce solid waste by up to 80%.

Several end uses for the cellulosic component of the waste have been identified by WRT. In addition, ferrous and non-ferrous metals and plastics can be separated for sale in their respective markets. WRT is working to site a permanent facility in the Lawrenceburg area that would make this process more available to Fernald and the Cincinnati market.

For More Information

Call DOE-FEMP Public Information Officer Gary Stegner, 513-648-3153, or write:

Gary Stegner
U.S. Department of Energy
Fernald Environmental Management Project
P.O. Box 538705
Cincinnati, OH 45253-8705

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FERNALD
Environmental Management Project

July 1997

COPPER INGOT DISPOSITION ALTERNATIVES

Overview

The Department of Energy (DOE) completed analyses to select a disposition alternative for 59 metric tons of copper ingots from the Fernald Environmental Management Project (FEMP).

A range of competing disposition methods was analyzed and two leading alternatives identified: 1) recycle at a copper refinery, and 2) the default option of disposal as low level waste. To allow unrestricted release for recycle, authorized limits were developed in accordance with DOE Order 5400.5 *Radiation Protection of the Public and the Environment* and the DOE *Handbook for Controlling Release for Reuse or Recycle of Property Containing Residual Radioactive Material.* To compare the recycle and disposal alternatives, the Draft Final *Decision Methodology for Fernald Material Disposition Alternatives* was utilized as the decision-making framework.

Results

Alternative 1, recycle at a copper refinery, complies with all regulatory requirements, is protective of human health, and is more cost effective than the disposal alternative. The recycle alternative dominated the disposal alternative when analyzed under the *Decision Methodology*, producing performance measures that were as good as, or better than, disposal in every case.

Background

During the mid-seventies 1,090 metric tons of scrap copper motor windings and electrical bus bar from the DOE gaseous diffusion plants were sent to the Fernald site for recycle. About 109 metric tons of this scrap was melt-refined in 1980 to produce "clean" copper ingots for reuse/recycle. Fifty metric tons of the copper were used to manufacture components for use at the DOE Hanford site. The remaining 59 metric tons remained in storage at Fernald pending development of release limits to address the slight amount of volumetric (mass) contamination.

Authorized Limits

Under DOE Order 5400.5, authorized limits may be developed on a case-by-case basis to provide standards for release of materials with volumetric contamination. In January 1997, DOE initiated an effort to develop release limits for the copper ingots using the most recent DOE guidance and state-of-the-art pathway analysis tools.

Some of the key steps in developing authorized limits and the results from the analysis are described below:

Characterization of the copper ingots.

The scrap copper was shredded, granulated, air separated from plastic and insulation, and finally melt-refined in vacuum induction furnaces in Plant 5. The resulting copper ingots cast from the process have the following physical attributes:

- approximately 270 ingots;
- 7-8" diameter x 30" high cylinders;
- average weight 480 pounds.

The copper ingots are considered high-grade scrap copper and based on minor chemical impurities would require refining prior to use in electrical applications.

The ingots average 4.25 pico-Curies per gram of uranium (1.6 ppm) which is within the range of natural uranium found in Ohio soils. If all of the uranium dispersed throughout a single ingot were evenly distributed over its surface, the surface activity would be about 11 disintegrations per minute (less 1% of the surface release limit for fixed contamination).

Dose assessment to determine radiation exposures under release scenarios.

The dose assessment was completed using the RESRAD-RECYCLE pathway analysis computer model, which is designed specifically for scrap metal recycle. Exposures to workers and members of the general public were calculated for individual exposures during each step of the copper recycling process including transportation, refining, semi-fabrication, manufacturing, and end-product use.

Dose to the maximally exposed individual (MEI) and cumulative population doses were calculated for the "actual and likely" and "worst plausible" release scenarios. The highest modeled exposures were as follows:

Exposure	Individual Dose (mrem/yr)	Cumulative Dose (person-rem)
Scrap loader	0.0013	0.000002
Slag worker	0.0177	0.000018
Plumbing tube	0.0007	0.031
Frying pan	0.0005	0.011
Copper IUD	0.0001	0.043

The dose to the MEI is well below the 100-mrem annual dose limit specified in DOE Order 5400.5.

Cost analysis to determine the full life cycle cost of implementing a selected alternative.

The sale of 59 metric tons of copper ingots as copper scrap is estimated to generate over $60,000 in revenue for DOE compared with a cost for off-site disposal of about $40,000. This cost differential provides ample margin in the event some surface decontamination is required prior to release.

ALARA analysis to confirm that the alternative maintains radiation exposures as low as reasonably achievable.

ALARA analysis demonstrated that exposures were as low as reasonably achievable, with doses less than a few mrem per year for the MEI and cumulative population doses well below 10 person-rem.

Additional criteria that may influence selection of a disposition alternative.

Additional factors considered included schedule impacts, local economic impacts, institutional preferences, local social preferences, and environmental impacts. The recycle alternative was as good as, or better than, the disposal alternative for each of these performance measures.

Next Steps

Stakeholder Coordination – DOE will respond to any stakeholder issues or questions raised concerning the project.

Application for Authorized Limits – DOE will coordinate with regulators and obtain formal approval from the Ohio Field Office for implementation.

For More Information...

Call DOE Public Information Officer Gary Stegner at (513) 648-3153, or write to him at the following address:

Gary Stegner
U.S. Department of Energy
Fernald Environmental Management Project
P.O. Box 538705
Cincinnati, OH 45253-8705

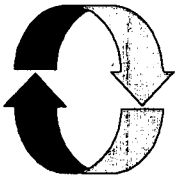
Visit the Fernald Web site at www.fernald.gov.

FERNALD
Environmental Management Project

March 1997

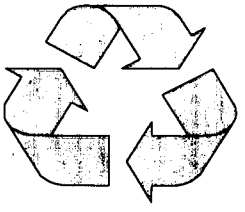
FEMP METALS RECYCLING

Fernald Life-Cycle Decision Methodology



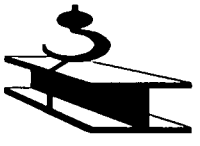
Two phased approach tool which includes a life-cycle costing phase and a life cycle analysis phase. This tool is currently being used by Fernald to help decision makers determine the most economically advantageous process for disposition of radioactive contaminated steel.

Plant 7 Recycle Initiative



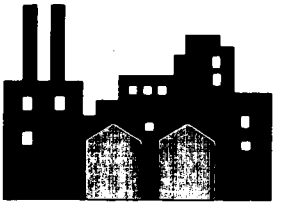
760 tons of radiologically contaminated carbon steel was sent off-site to a recycling vendor. 460 tons of the material was grit blasted to meet DOE order 5400.5 free release criteria. The additional 300 tons was mangled to a point where the operators could not decontaminate the steel. Lessons learned indicate a better material handling of the steel would have prevented this 300 tons from being untreatable.

Plant 1 Ore Silo



20 tons of radiologically contaminated steel was grit blasted using site personnel at Fernald, This effort was performed to determine the economics of removing both thorium and uranium from the surface of carbon steel.

Boiler Plant RFP



A special RFP(Request for Proposal) was prepared, with alternatives for the D&D of the FEMP Boiler Plant. The lessons learned from Plant 7, Plant 4, and Plant 1 Ore Silos presented additional data which identified cost savings by not cutting the carbon steel into 10ft sections, but to cut them into 19ft sections.

Plant 4

As part of the Plant 4 D&D, the Fernald Life-Cycle Decision Methodology was implemented to determine the usefulness of the tool. The tool was considered very helpful and is currently being modified to address some of the findings from the Plant 4 case study.

For More Information

Call DOE-FEMP Public Information Officer
Gary Stegner at 513-648-3153 or
Pete Yerace at 513-648-3161, or write:
Gary Stegner
U.S. Department of Energy
Fernald Environmental Management Project
P.O. Box 538705
Cincinnati, Oh 45253-8705

Recycling Methodology Public Workshop

Fernald Environmental Management Project

July 8, 1997

Workshop Evaluation

Thank you for attending the workshop to discuss the Draft Final Recycling Methodology. Your feedback is very important. Please take a minute to complete this short evaluation.

1. Did the topics presented tonight help to clarify the application of the *Decision Methodology for Fernald Material Disposition Alternatives* and material disposition issues?

Summary of changes to the Recycling Methodology	Yes _____	Somewhat _____	No _____
Plant 4 case study and hypothetical case study	Yes _____	Somewhat _____	No _____
Decision Phase	Yes _____	Somewhat _____	No _____
Future applications of Methodology	Yes _____	Somewhat _____	No _____
Free Release	Yes _____	Somewhat _____	No _____

2. In general, were you satisfied with the responses to questions?

3. Please indicate any related issues or topics of interest for future meetings (or communications) with stakeholders.

4. How did you hear about the Recycling Methodology public workshop (please check all that apply):

Post card notice	_____
Letter	_____
Local newspaper ad	_____
Fernald employee	_____
Fernald publications	_____
Fernald Community Message Line (648-6272)	_____
Fernald Web Site (www.fernald.gov)	_____
Other	_____

5. Please indicate whether you attended any previous workshops on this subject.

June 11, 1996, Recycling public workshop	_____
Nov. 7, 1996, Recycling Methodology and Plant 4 Case Study public workshop	_____

6. Are there any additional questions, comments or concerns you would like addressed?

If you did not receive a post card invitation to tonight's meeting, then you may not be on Fernald's Community Mailing List to receive cleanup news, meeting invitations and document review notices. If you would like to be on the mailing list, please complete the information on the following side.

Public Affairs Mailing List Addition Request

To be added to the Public Affairs mailing list, please complete this form. If the question does not apply to you, please write "n/a".

Please spell out all names -- do not use initials.

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Home Phone _____ **Work Phone** _____ **Fax** _____

Township _____ **County** _____

* The second address line is a continuation of an address for example:

Bob Smith
444 W. 3rd St.
Room 3134
Anywhere, USA 12345

DECISION METHODOLOGY FOR FERNALD MATERIAL DISPOSITION ALTERNATIVES

DRAFT FINAL
May 8, 1997

Prepared by:

Fluor Daniel Fernald
in cooperation with Oak Ridge National Laboratory

Prepared for:

U.S. Department of Energy
Fernald Environmental Management Project
Cincinnati, Ohio 45253

EXECUTIVE SUMMARY

This document describes a methodology that has been developed to help decision makers compare and select among competing alternatives for the disposition of radioactively contaminated materials at the Department of Energy's (DOE) Fernald Environmental Management Project (FEMP). The methodology provides a generic framework for assessing, presenting, and summarizing all of the information important to the decision, and includes a mechanism for ensuring public participation in the decision making process. The basic methodology approach is generally applicable to evaluate the disposition of most any type of material generated by remediation of most any DOE site. However, this document focuses on the application of the methodology to the evaluation of disposition alternatives for scrap structural steel generated by demolition of FEMP OU3 facilities as a test case.

The methodology is divided into three (3) phases: the Threshold Phase, the Life Cycle Analysis Phase, and the Decision Phase. In the first phase (Threshold Phase), the alternatives are evaluated based on the "threshold criteria" of protectiveness of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs), and the total cost (which is defined as the Net Present Value of the Life Cycle Cost, or NPV/LCC). Alternatives which fail to meet minimum standards in terms of protectiveness of human health and the environment and compliance with ARARs, and which are not within 25% of the total cost (NPV/LCC) of the lowest cost alternative (assuming the lowest cost alternative also meets the protectiveness of human health and the environment and compliance with ARARs thresholds), will receive no further consideration under this methodology.

NOTE: Per the FEMP OU3 Final Record of Decision (ROD), the selected final remedial action for the majority of OU3 radiologically contaminated material, including scrap structural steel, is placement in the On Site Disposal Facility (OSDF).

In the second phase (Life Cycle Analysis Phase), the alternatives which meet the threshold criteria described above are evaluated in terms of the six (6) performance measures, and the results are tabulated on the Decision Summary Matrix. (See Figure 1.) The performance measures take into consideration both quantitative and qualitative factors, and are identified as follows: Total Cost, Schedule Impacts, Local Economic Impacts, Institutional Preference, Local Social Preference, and Environmental Impact. The methodology includes both the analytical requirements to develop defensible values for this comprehensive set of performance measures, and the structure for using the performance measures to compare and rank alternative proposals.

In the third phase (Decision Phase), the alternatives will be ranked using multiattribute decision analysis, in which the results of the Analysis Phase (as tabulated on the Decision Summary Matrix) will be converted to a uniform, normalized scale so that an aggregate total score may be computed for each alternative. The alternative with the highest score becomes the highest ranking alternative for the purposes of this methodology. Sensitivity analyses will also be performed as part of this phase to identify conditions under which the rank order of alternatives may change. (Please note that the results of this phase do not necessarily dictate the final decision. The methodology is only one tool to be used by the decision makers to help formulate the final decision.)

This methodology will be applied on a case-by-case basis to help determine the best

alternative for disposition of individual, discrete lots of material. The final decision for each lot will be based in part on the methodology, but may also take other significant factors into account, such as contemporary FEMP budget projections and funding availability. Final decisions for discrete lots of material will be discussed in an appendix to each corresponding FEMP OU3 D&D Implementation Plan. These discussions will address not only the application of the methodology (including sensitivity analysis of key performance measures), but also any other key factors which played a significant role in the final decision, but which may not have been accounted for in the methodology.

1. INTRODUCTION

The purpose of this methodology document is to describe a tool that will help FEMP decision makers to compare and select among competing alternatives for the disposition of Operable Unit 3 (OU3) radioactively contaminated materials. Per the OU3 ROD, the selected final remedial action for the disposition of OU3 scrap structural steel is placement in the FEMP OSDF. The OU3 ROD remedy is based on multiple factors including cost, sitewide "balanced approach," and protection of human health and the environment. The OU3 ROD also recognized that recycling or reuse alternatives may become competitive with the ROD remedy (OSDF placement) in the future (due to changes in comparative costs or the availability of breakthrough technologies) and committed DOE to evaluate alternatives to OSDF placement.

This methodology will address structural steel; however, once successfully demonstrated on the structural steel test case, the methodology may be applied to other types of scrap metal or other OU3 material categories. Also, the possibility exists that the disposition alternatives, performance measures, and corresponding weighting factors may change over time to reflect new information, breakthrough technologies, etc. Significant changes of this nature will be thoroughly addressed in the appropriate OU3 D&D Implementation Plans.

2. DESCRIPTION OF DECISION METHODOLOGY

This methodology utilizes a Life Cycle Analysis (LCA) approach to decision making. The generic LCA process (which is represented as a flowchart in Figure 2) has widespread applicability and has been frequently utilized at DOE facilities as a tool to aid decision makers in resolving a variety of issues. The generic LCA process is usually modified to some extent each time it is implemented so that issues specific to the site or the problem being addressed can be incorporated into the analysis. In other words, the generic LCA methodology can (and should) be custom tailored to fit each unique, specific case to which it is applied. This document focuses on the generic LCA methodology as it has been tailored to address the very specific case of evaluating disposition alternatives for FEMP OU3 radiologically contaminated scrap structural steel.

The methodology for evaluating disposition alternatives for FEMP scrap metal consists of three distinct phases. In Phase 1 (Threshold Phase), each alternative is evaluated for compliance with a set of threshold criteria. Alternatives which fail to meet the threshold criteria are eliminated from further evaluation under Phases 2 and 3. In Phase 2 (Life Cycle Analysis Phase), a life cycle analysis is performed for FEMP scrap metal disposition alternatives. In Phase 3 (Decision Phase), the information and data generated during Phase 2 will be used as an aid to decision makers in selecting a preferred disposition alternative. These three phases of the methodology are defined in more detail in the following sections.

2.1 THRESHOLD PHASE

Phase 1 includes the identification of the specific alternatives to be considered for the disposition of OU3 scrap metal. This step includes a detailed description of the system of activities (the general processes) that are involved in carrying out a particular alternative. For example, in a metal melt option, the key steps of metal extraction, packaging, and shipment to a smelter would be outlined, as well as the key decisions and other issues that might be faced in carrying out that alternative. The four (4) disposition alternatives currently under consideration for OU3 scrap metal and the OU3 ROD remedy (OSDF placement) are defined in greater detail in Section 4.

NOTE: Per the FEMP OU3 Final ROD, the selected final remedial action for the majority of OU3 radiologically contaminated material, including scrap structural steel, is placement in the OSDF.

This initial phase of the methodology also serves as a screening tool to help reduce the number of alternatives which are ultimately subjected to the complete three phase methodology. The Threshold Phase calls into play a set of threshold criteria, which reflect the FEMP commitment to incorporating certain core values into all FEMP activities. Many alternatives will possibly be found lacking in one or more of the threshold criteria and will therefore be eliminated from further consideration.

The first of the threshold criteria is protectiveness of human health and the environment. Inclusion of this criterion in the Threshold Phase demonstrates that the FEMP shares the concerns of stakeholders concerning protection of human health and the environment. Any alternative which is not adequately protective of human health and the environment will immediately be eliminated from further consideration for implementation at the FEMP.

The second threshold criterion is compliance with applicable or relevant and appropriate requirements (ARARs). Any alternative which does not meet the ARARs of Federal and State environmental statutes and/or provide grounds for invoking a waiver will immediately be eliminated from further consideration for implementation at the FEMP.

The third threshold criterion is total cost (expressed as NPV/LCC). The NPV/LCC will be estimated for each alternative which passes the protectiveness of human health and the environment and compliance with ARARs tests. Of these alternatives, the one with the lowest NPV/LCC automatically proceeds to Phase 2 (Life Cycle Analysis Phase, see Section 2.2 below). Any other of the remaining alternatives (i.e. any alternatives which pass the protectiveness of human health and the environment and the compliance with ARARs tests) which are within 25% of the NPV/LCC of the lowest cost alternative also proceed to Phase 2. If only the lowest cost alternative makes it to Phase 2 (no other alternatives are within the 25% cost threshold), then Phases 2 and 3 become unnecessary and the lowest cost alternative becomes the preferred alternative.

2.2 LIFE CYCLE ANALYSIS PHASE

The second phase of the methodology is the Life Cycle Analysis Phase. Again, only alternatives which have passed the Threshold Phase will be evaluated in Phases 2 and 3. The values, data, and scores which will be entered onto the Decision Summary Matrix represent the end-result of the Life Cycle Analysis Phase.

Life cycle analysis is the process of identifying and assessing all categories of benefits and costs that result from a course of action over the entire period of time affected by the action, quantifying those benefits and costs where possible, and providing results that promote sound decision-making. A life cycle analysis provides a logical approach to the comprehensive assessment of alternatives, which is mandated by the uncertain, hidden, and at times seemingly unreasonable costs and benefits of alternative proposals.

The elements of a life cycle analysis depend on the purpose of the analysis and the availability of specific data. In general, however, elements of a life cycle analysis consist of direct costs and benefits (which derive from the outlays that DOE would expend), socio-economic issues, and environmental, safety, and health impacts. For the case of FEMP scrap metal disposition alternatives, these general elements of life cycle analysis are reflected in the following six (6) performance measures: Total Cost, Schedule Impacts, Local Economic Impacts, Institutional Preference, Local Social Preference, and Environmental Impact. These performance measures, and the methods to be used to quantify and "score" the disposition alternatives for each performance measure, are defined in greater detail in Section 3.

The final step of the Life Cycle Analysis Phase is to summarize the results of the analysis for use by the decision makers. For the quantitative performance measures (Total Cost, and Schedule Impacts), the actual quantities estimated for each alternative are entered on the Decision Summary Matrix. Total Cost will be expressed in dollars, and Schedule Impacts will be expressed in working days.

For the qualitative performance measures (Local Economic Impacts, Institutional Preference, Local Social Preference, and Environmental Impact), a "score" of 1, 2, 3, 4, or 5 will be entered on the Decision Summary Matrix to indicate the performance of each alternative relative to the others. In general, a score of "1" equates to "least desirable," while a score of "5" is "most desirable." However, these scores may have a more specific meaning for each individual performance measure. A more detailed definition of the scores 1, 2, 3, 4, and 5 is given in Section 3, where the performance measures are explained in greater depth.

The output of the Life Cycle Analysis Phase is a completed Decision Summary Matrix listing the disposition alternatives along the top and the performance measures along the side, as illustrated in Figure 1. Within each cell of the matrix will be the value or score of the performance measure for that alternative.

2.3 DECISION PHASE

In the third phase (the Decision Phase), the alternatives will be ranked using the scores and data presented in the Decision Summary Matrix and weighting factors for the performance measures, and a highest ranking alternative will be selected. This phase incorporates a set of standardized weighting factors, which will be established by DOE-FEMP for the performance measures and will reflect all the input received from stakeholders through public workshops, meetings, and other correspondence. Each performance measure will receive a weighting factor which indicates the relative importance of that performance measure in the overall decision. A performance measure with a high weighting factor is considered more important to the decision than one with a low weighting factor. The weighting factors will be expressed in percent (%), and the sum of all the weighting factors must equal 100%. To complete the multiattribute analysis, a total "score" will be calculated for each alternative by multiplying the weight percent for each performance measure by the corresponding score or data value (as expressed on a uniform, normalized scale) for the alternative from the Decision Summary Matrix. The alternatives will then be ranked from highest to lowest based on total score.

The Decision Phase will also include the results of sensitivity analyses which will identify the "crossover points," or the conditions under which the rank order of the alternatives would change. Sensitivity analyses will be primarily focused on the Total Cost and Schedule Impacts performance measures, and will be used to estimate the extent to which the values listed on the Decision Summary Matrix would need to change before the rank order of alternatives would change.

Identification of crossover points can be very useful to the decision makers. For example, in a hypothetical case in which the highest ranking alternative happened to have the lowest Total Cost, a sensitivity analysis could be performed in which all factors (except Total Cost) were held constant. The value for Total Cost for the highest ranking alternative would be progressively increased and plugged into the formula for calculating total score until the total scores for the first and second highest ranking alternatives were equal (i.e., the "crossover point"). By subtracting the actual Total Cost for the highest ranking alternative from the crossover point Total Cost for the highest ranking alternative, the decision maker would be able to determine how great of an increase would be required in the Total Cost for that alternative before it was no longer the highest ranking alternative. A similar scenario could be evaluated for the Schedule Impacts performance measure.

This methodology will be applied on a case-by-case basis to help determine the best alternative for disposition of individual, discrete lots of FEMP scrap metal. The final decision for each lot will be based in part on the methodology, but may also take other significant factors into account, such as FEMP schedule and budget projections and funding availability. Final decisions for various lots of material will be discussed in an appendix to each corresponding FEMP OU3 D&D Implementation Plan. These discussions will address not only the application of the methodology (including sensitivity analyses), but also any other key factors which played a significant role in the final decision, but which may not have been accounted for in the methodology.

3. DESCRIPTION OF PERFORMANCE MEASURES

In this section a list of performance measures and the means for their analysis is presented. However, this methodology is an iterative process and may be refined and improved with each successive application. Any significant changes to the performance measures or the means for their analysis will be fully explained in the final decision document for each methodology application (i.e. an appendix to each corresponding FEMP OU3 D&D Implementation Plan). Furthermore, this list of performance measures was generated for the specific case of FEMP OU3 scrap structural steel disposition. To apply the generic methodology to other materials at other facilities may require the generation of a different list of performance measures which would specifically address the situation being evaluated.

3.1 TOTAL COST

This performance measure is the total of all financial costs and benefits that are paid or received by the DOE and that can be directly attributed to the implementation of a specific disposition alternative. These costs include the direct budget allocations to the project and also the incremental costs to other activities, such as permitting, monitoring, or other compliance costs. Costs must cover the full scope of the project, including size reduction, packaging, storage, transportation, secondary waste management and disposition, etc. Likewise, financial benefits include the direct proceeds to the project through such actions as sale of recycled products, and benefits to other activities through reduced costs or improved schedules. Costs not directly related to implementation of a specific alternative (such as "sunk" costs which are not specific to any particular alternative) will not be included in this performance measure.

Analysis of the direct financial costs requires a number of steps. First, the necessary data must be found, or generated if not readily available. Some costs will have uncertainty ranges associated with their estimates, in which case the range maximum will be used. Overhead costs will be extracted and included in the total cost estimate for each alternative, as appropriate. In addition, the estimated costs of future liabilities will be included in the total cost.

3.1.1 Net Present Value of Life Cycle Cost

The total cost of each alternative will be measured in dollars, calculated as the net present value (NPV) of the total life cycle cost (LCC). NPV is the standard criterion for deciding whether a government program can be justified on an economic basis. NPV is computed by assigning monetary values to benefits and costs, discounting future benefits and costs using an appropriate discount rate, and subtracting the sum total of discounted costs from the sum total of discounted benefits. Discounting benefits and costs transforms gains and losses occurring in different time periods to a common unit of measurement.

A detailed cost analysis will be conducted for each alternative, and the NPV/LCC, measured in dollars, will be reported for each alternative and entered onto the Decision Summary Matrix. To perform the financial cost analysis, a spreadsheet model will be used to facilitate estimating costs for a variety of alternatives rapidly and efficiently. (The spreadsheet will also simplify the performance of sensitivity analyses in the Decision Phase.) The

spreadsheet will estimate costs by specific time periods, which will coincide with the information found in the analysis of the Schedule Impacts performance measure. (See Section 3.2, below.)

3.1.2 Unit Cost

The unit cost will also be presented for each alternative on the Decision Summary Matrix, in terms of dollars per bank cubic foot ($/bcf). The unit cost is derived directly from the NPV/LCC estimate, and is calculated by dividing the NPV/LCC total dollars by the number of bank cubic feet of scrap metal to which the methodology is being applied. The unit cost is presented for informational purposes only, and will not be utilized in the Decision Phase as part of the multiattribute decision analysis.

3.2 SCHEDULE IMPACTS

The recycle and disposal alternatives may result in different program schedules. The impact on program schedule as a performance measure will capture schedule delays or accelerations under the alternatives. Schedule impacts will be expressed as the total elapsed time (measured in working days) required to implement the alternative, starting on the date the analysis is initiated and ending on the date when all activities associated with the alternative are completed. The time to complete each alternative will be estimated based on a detailed programmatic analysis conducted in conjunction with the cost analysis, and will incorporate such factors as the projected demolition schedules for OU3 structures, OSDF material placement schedules, availability of recycling services, and waste shipment and disposal schedules. The total number of working days required to complete each alternative will be entered onto the Decision Summary Matrix.

3.3 LOCAL ECONOMIC IMPACTS

This performance measure addresses the economic impacts on the surrounding community, including effects on employment, the tax base, average household income, business sales, and property values. For the specific case of evaluating disposition alternatives for FEMP OU3 scrap structural steel, it is unlikely that tax base, average household income, business sales, or property values would be significantly impacted by any of the alternatives. However, a measurable difference in the number of workers employed would probably result from implementing one alternative versus another. Therefore, this performance measure will be expressed simply in terms of person-years of employment. For example, an alternative which resulted in the employment of 5 people for 1 year (or 1 person for 5 years) would equate to 5 person-years. An alternative which resulted in the employment of 5 people for 4 years would equate to 20 person-years, and so on. To apply the methodology at another DOE site (for example, a site where the economy of the surrounding community is greatly influenced by the DOE site activities), a more elaborate, exhaustive evaluation of this performance measure would be required.

To measure Local Economic Impacts, a constructed scale based on person-years of employment will be used in which each alternative is assigned a "score" of 1, 2, 3, 4, or 5, based on the definitions given below. The score for each alternative will be entered onto the Decision Summary Matrix.

The definitions of the score choices for the Local Economic Impacts performance measure are as follows:

1 means the alternative would result in the loss of 25 or more person-years of employment;

2 means the alternative would result in the loss of between 5 and 25 person-years of employment;

3 means the alternative would result in the gain or loss of no more than 5 person-years of employment;

4 means the alternative would result in the gain of between 5 and 25 person-years of employment;

5 means the alternative would result in the gain of 25 or more person-years of employment.

3.4 INSTITUTIONAL PREFERENCE

This performance measure addresses how well each alternative adheres to applicable government policies, such as resource conservation mandates, privatization considerations, preference for reuse or recycling over disposal, and obligations to utilize final (rather than interim) solutions for site remediation. It addresses the views of DOE, EPA, and other federal, state, and local institutions and regulatory agencies.

The analysis of the Institutional Preference performance measure will be qualitative and will rely largely on information provided by government agency officials. A constructed scale will be used in which each alternative is assigned a "score" of 1, 2, 3, 4, or 5, based on the definitions given below. The score for each alternative will be entered onto the Decision Summary Matrix.

The definitions of the score choices for the Institutional Preference performance measure are as follows:

1 means the alternative utilizes interim (rather than final) solutions, does not include reuse or recycle, and lacks private participation;

2 means the alternative utilizes final solutions, but does not include reuse or recycle, and lacks private participation;

3 means the alternative utilizes final solutions, and includes either reuse/recycle or private participation (but not both);

4 means the alternative utilizes final solutions, includes recycle or reuse, but lacks private participation;

5 means the alternative utilizes final solutions, includes recycle or reuse, and includes private participation.

3.5 LOCAL SOCIAL PREFERENCE

This performance measure addresses the relative preference of local public stakeholders for the different disposition alternatives. Public participation will be solicited for the initial application of the methodology and for subsequent applications of the methodology if there are substantive changes to the alternatives, performance measures, or material type being evaluated. Individual members of the public will be asked to indicate their preference by assigning a score of 1, 2, 3, 4, or 5 to each alternative. This is a subjective assessment on the part of the stakeholder based on his or her individual, personal understanding of the alternatives, data, and other information pertinent to evaluating the issue. An average for all responses received from the public will be calculated, and this average score will be entered onto the Decision Summary Matrix.

The definitions of the score choices for the Local Social Preference performance measure are as follows:

1 means the alternative fails to meet local public stakeholder desires for FEMP remediation in many areas;

2 means the alternative fails to meet local public stakeholder desires for FEMP remediation in some (but not many) areas;

3 means the alternative fails to meet local public stakeholder desires for FEMP remediation in very few areas;

4 means the alternative meets local public stakeholder desires for FEMP remediation in all areas;

5 means the alternative meets local public stakeholder desires for FEMP remediation in all areas and exceeds stakeholder desires in some areas.

3.6 ENVIRONMENTAL IMPACT

A key element of life cycle analysis is the study, not only of the immediate risks from each alternative, but the risks avoided (or benefits realized) by not pursuing other alternatives. Just as the direct financial benefit of recycle is already captured in the Total Cost performance measure as the price received for the recycled material, the environmental benefits from the avoided releases of hazardous materials created during virgin steel production and raw material mining are captured in the Environmental Impact performance measure.

The Environmental Impact performance measure addresses potential adverse (or beneficial) impacts on the environment, including physical degradation of surrounding or affected ecological systems and harmful effects on plants and animals. This performance measure is used to assess potential widespread, localized, and long- and short-term impacts on entire ecological systems or constituents. The Environmental Impact performance measure is also used to describe impacts resulting in loss of use of natural resources such as land or water.

The analysis of the Environmental Impact performance measure will be qualitative and will rely primarily on input from DOE-FEMP. A constructed scale will be used in which each alternative is assigned a "score" of 1, 2, 3, 4, or 5, based on the definitions given below. The score for each alternative will be entered on to the Decision Summary Matrix.

The definitions of the score choices for the Environmental Impact performance measure are as follows:

1 means that the alternative causes two or more of the following to occur: a) an overall increase in emissions or discharges to any environmental media, b) an overall increase in injury or destruction of a natural resource, or c) an overall increase in restriction of future land use;

2 means that the alternative causes one of the following to occur: a) an overall increase in emissions or discharges to any environmental media, b) an overall increase of injury or destruction of a natural resource, or c) an overall increase in restriction of future land use;

3 means that the alternative results in an overall neutral impact to all of the following: a) emissions or discharges to any environmental media, b) injury or destruction of a natural resource, and c) restriction of future land use;

4 means that the alternative causes one of the following to occur: a) an overall decrease in emissions or discharges to any environmental media, b) an overall reduction of injury or destruction of a natural resource, or c) an overall reduction in restriction of future land use;

5 means that the alternative causes two or more of the following to occur: a) an overall decrease in emissions or discharges to any environmental media, b) an overall reduction of injury or destruction of a natural resource, or c) an overall reduction in restriction of future land use.

4. DISPOSITION ALTERNATIVES

The four (4) disposition alternatives currently under consideration for FEMP OU3 scrap metal and the OU3 ROD remedy (OSDF) are described in the following sections. All of the alternatives are fully compliant with applicable laws and regulations and are implementable (i.e. they are technically and administratively feasible and rely on available services and materials). This methodology is designed to be very flexible and to accommodate emerging technologies and changes to key parameters over time. Disposition alternatives may be added, deleted, or significantly modified as the methodology is implemented for individual lots of material, as appropriate. Furthermore, this list of alternatives was generated for the specific case of FEMP OU3 scrap structural steel disposition. To apply the methodology to other materials at other facilities may require the generation of a different list of alternatives which would specifically address the situation being evaluated.

4.1 ON-SITE DISPOSAL FACILITY (OSDF), OU3 ROD REMEDY

The OU3 ROD remedy declares that the radiologically contaminated scrap structural steel will be disposed in the FEMP permanent on-site disposal facility (OSDF) along with other FEMP wastes. The OSDF will be designed and constructed in accordance with the relevant requirements of the Resource Conservation and Recovery Act (RCRA) and the Uranium Mill Tailings Remediation Control Act. The facility will feature a multi-layer capping system, including a vegetative soil layer, a filter layer, a biotic barrier, a drainage layer, and an infiltration barrier. The OSDF will also feature a multi-layer liner that will include a leachate collection system, primary and secondary liners separated by a leak detection system, and a low-permeability compacted clay layer. The layers of both the cap and liner will be separated by geotextile fabrics and high-density polyethylene and bentonite composites for added protection. The OSDF will prevent contamination migration to the air and surface water and is modeled to protect groundwater for a 200 to 1,000 year performance period.

4.2 FEMP MATERIAL RELEASE FACILITY (FEMP MRF)

In this alternative, the scrap metal will be decontaminated by FEMP work crews in an on-site FEMP Material Release Facility (MRF) to meet the unrestricted release guidelines of DOE Order 5400.5 (or applicable regulations which may supersede DOE Order 5400.5). The decontaminated scrap metal will be sold to scrap metal dealers or recyclers with no restrictions on end use. This alternative includes such activities as loading steel onto trailers and transporting to the onsite MRF, unloading the steel, processing the steel through the MRF (including decontamination by abrasive blasting), surveying the steel for unrestricted release, loading the clean steel onto trailers and removing it from the radiological control area, selling the clean steel to a scrap dealer, and disposing of the secondary waste.

4.3 OFF-SITE VENDOR MATERIAL RELEASE FACILITY (VENDOR MRF)

In this alternative, the scrap metal will be containerized at the FEMP and shipped to an off-site vendor's MRF for decontamination and unrestricted release. The decontaminated scrap metal will be sold to scrap metal dealers or recyclers with no restrictions on end use. This alternative includes such activities as placement of a subcontract with a vendor for decontamination services, packaging the steel into containers and transporting it to the vendor's facility, processing the steel at the vendor's facility (including decontamination by abrasive blasting), surveying the steel for unrestricted release, transporting secondary waste to the FEMP, and disposing of the secondary waste.

4.4 OFF-SITE METAL-MELT AND RESTRICTED REUSE (RECYCLE 2000)

In this alternative, the scrap metal will be containerized at the FEMP and shipped to an off-site vendor's facility where the contaminated scrap metal will be melted and re-fabricated into restricted use products, such as metal boxes for radioactive waste storage and disposal. These restricted use products will remain under DOE control. This alternative includes such activities as placement of subcontracts for decontamination, metal-melt, and fabrication services, packaging the steel into containers and transporting it to the vendor's facility, unloading and size-reducing the steel, melting the steel in a furnace to form billets, rolling the billets into sheets, fabricating restricted use products from the sheets, transporting secondary waste to the FEMP, and disposing of the secondary waste. Some key policy decisions from DOE could impact the implementation of this alternative.

4.5 VENDOR-OPERATED FEMP MRF (PRIVATIZED FEMP MRF)

In this alternative, a vendor would lease space on the FEMP site to set up vendor-owned equipment for the decontamination of the scrap metal to meet unrestricted release criteria. The decontaminated scrap metal would be sold to scrap dealers or recyclers with no restrictions on end use. This alternative includes such activities as loading the steel onto trailers and transporting it to the onsite MRF, unloading the steel, processing the steel through the MRF (including decontamination by abrasive blasting), surveying the steel for unrestricted release, loading the clean steel onto trailers and removing it from the radiological control area, selling the clean steel as scrap, and disposing of the secondary waste. Some key issues which would need to be addressed to implement this alternative are establishment of subcontracts, union labor issues, and subcontract vendor leasing of DOE facilities.

Figure 1

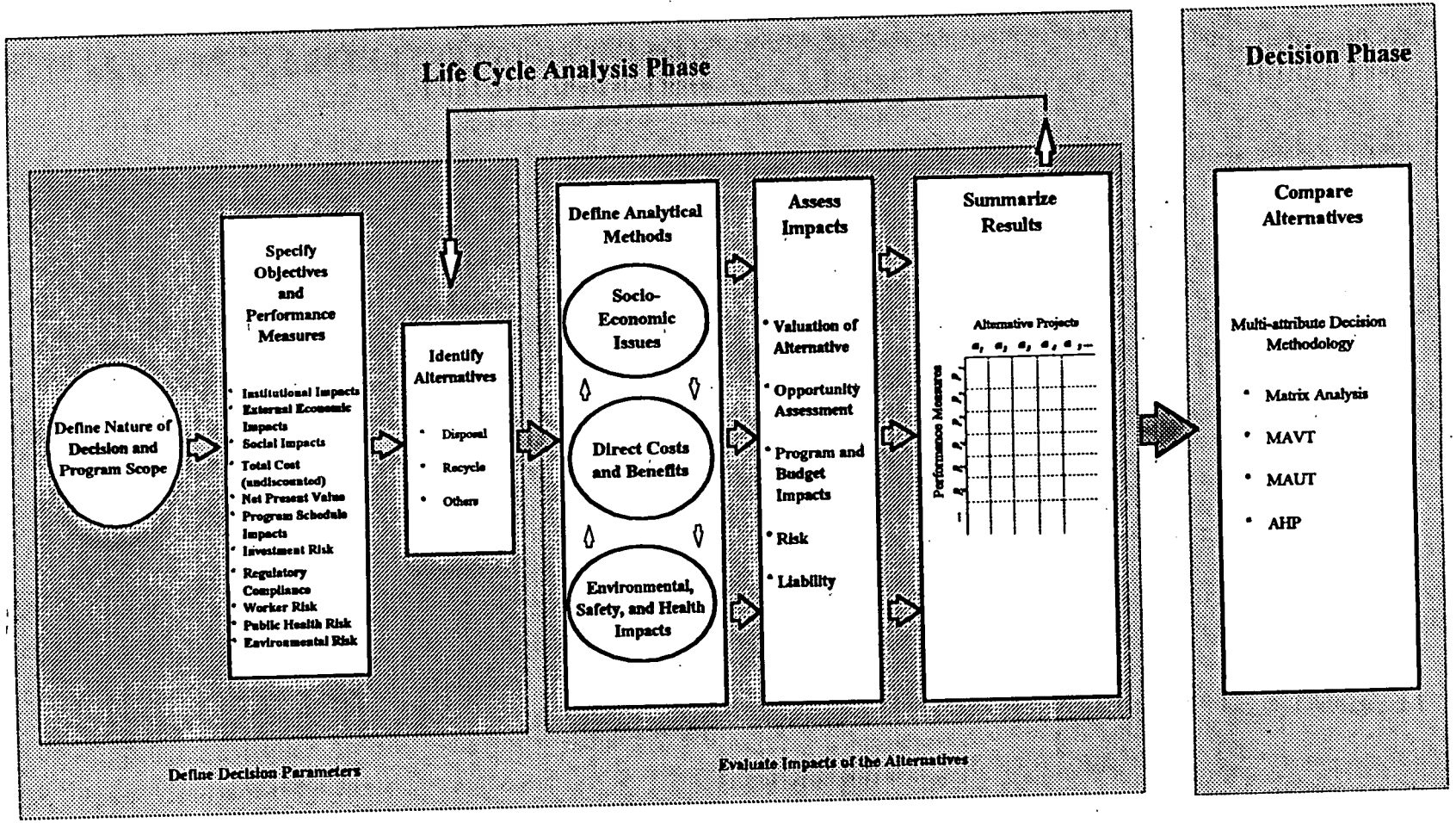
Decision Summary Matrix

PERFORMANCE MEASURES		ALTERNATIVES				
		1) OSDF* (OU3 ROD Remedy)	2) FEMP MRF	3) VENDOR MRF	4) RECYCLE 2000	5) PRIVATIZED FEMP MRF
Total Cost	NPV/LCC					
	Unit					
Schedule Impacts						
Local Economic Impacts						
Institutional Preference						
Local Social Preference						
Environmental Impact						

* - Per the OU3 Final ROD, the selected final remedial action for disposition of the majority of FEMP OU3 radiologically contaminated material, including scrap structural steel, is placement in the OSDF.

Figure 2

Generic Life Cycle Analysis Process



RESPONSE TO COMMENTS FROM OHIO EPA AND LOCAL PUBLIC STAKEHOLDERS ON DECISION METHODOLOGY FOR FERNALD MATERIAL DISPOSITION ALTERNATIVES

Comment: The scope of this methodology has been limited to scrap metals only. In fact, only two metals are specifically mentioned, steel and lead. To what if any extent will this decision methodology be extended to other materials such as scrap copper, stainless steel, concrete and similar wastes.

Response: The methodology has been revised to satisfy this comment. See the May 8, 1997 Draft-Final Methodology title page, in which "Scrap Metal" has been replaced with "Material." Also note the first paragraph of the Executive Summary, which states "The basic methodology approach is generally applicable to evaluate the disposition of most any type of material generated by remediation of most any DOE site". These changes, and others throughout the text, reinforce the intention of DOE-FEMP that the methodology be applicable to other materials, including those mentioned in the comment.

Comment: Is this decision methodology consistent with DOE national policy? The Ohio EPA has had an outstanding request for a copy of the national policy for quite some time.

Response: The decision methodology is consistent with the DOE "Policy on Recycling Radioactively Contaminated Carbon Steel" (dated September 20, 1996), which is available in the PEIC, and other DOE initiatives.

Comment: Section 4.1.1 discusses the criterion net present value. The Ohio EPA agrees that hidden costs in overhead accounts must be extracted and assigned to the appropriate alternative. Conversely hidden liabilities must also be estimated. In the example discussed in the third paragraph of this section, incremental costs associated with disposal of metal in the OSDF are mentioned. How can these incremental costs be estimated? In response to similar questions regarding incremental costs associated with disposing of a unit volume of monolithic concrete, Ohio EPA was told that there was in fact no incremental cost increase associated with the disposal of bulk objects. This response is counter intuitive.

Response: These estimates will be based on historical experience and engineering design. For example, based on historical experience and engineering design of the disposal cell, it is expected that the unit cost for disposal of structural steel will be greater than the unit cost for disposal of soil. This is because of the increased labor required for placement of the metal and compaction of the soil around the metal. Please note that the May 8, 1997 Draft-Final Methodology defines Total Cost in Section 3.1 as "...the total of all financial costs and benefits that are paid or received by the DOE and that can be directly attributed to the implementation of a specific disposition alternative."

Comment: Section 5.2 discusses "Structured Multiattribute decision making approaches". The Ohio EPA agrees that the progressive articulation of preferences method is open to criticism because it is open to manipulation. One solution to this problem was to use interactive search methods as mentioned in the last sentence of the third paragraph on page 22. However, the use of interactive search methods was not further discussed. Considering the inherent problems with progressive methods, a more thorough discussion of interactive search methods seems appropriate.

Response: The Methodology has been revised to identify the specific decision technique (multiattribute decision analysis with supporting sensitivity analysis and identification of crossover points). See Section 2.3 "Decision Phase" of the Draft-Final Methodology for a thorough discussion of these methods.

Comment: The last sentence of Section 5.2 concludes that the analytical hierarchy process (AHP) is open to criticism because it produces inconsistent results. Is the Ohio EPA correct in inferring that either multiattribute value theory (MAVT) or multiattribute utility theory (MAUT) are therefore the preferred methods? If this is the case, please discuss the phrase "decision maker risk attitudes" which distinguishes the two theories. The phrase appears at the tope of page 23 and is not discussed further.

Response: The Methodology has been revised to address this comment. The Decision Phase and the specific techniques utilized are thoroughly discussed in Section 2.3 of the Draft-Final Methodology.

Comment: The Ohio EPA agrees with the first paragraph of Section 6 which concludes that this methodology should be applied to the entire FEMP site and also to the entire DOE complex.

Response: We concur. The Methodology has been revised to reinforce this intent.

Comment: Think Recycle or Reuse in every possible way before disposal.

Response: DOE-FEMP is committed to continually evaluate recycle/reuse options for materials generated from FEMP remediation activities, and this Methodology is the primary tool for doing this. The Methodology has been revised to better reflect how this will be accomplished. In addition, pursuant to various stakeholder concerns regarding the issue of when it would be too costly to recycle, a 25% screen on cost (cost "threshold") has been incorporated. See Section 2.1 of the Draft-Final Methodology for a thorough discussion of the Threshold Phase.

Comment: Looking into an onsite disposal cell the discussion pertained to only soil, construction waste (i.e., cement, bricks, broken concrete), and small items. NO BULK.

Response: The Methodology has been revised to address this comment as follows: "Per the FEMP OU3 Final ROD, the selected final remedial action for the majority of OU3 radiologically contaminated material, including scrap structural steel, is placement in the OSDF." However, the Methodology also states "The OU3 ROD also recognized that recycling or reuse alternatives may become competitive with the ROD remedy (OSDF placement) in the future (due to changes in comparative costs or the availability of breakthrough technologies) and committed DOE to evaluate alternatives to OSDF placement.

Comment: No large machinery, bull dozers, trucks or items that must be surrounded with a foam like material.

Response: "Category 5" material will be addressed separately in an upcoming public meeting.

Comment: I would like to see FERMCO (FDF) and DOE follow the policy of Recycle or Reuse first and Disposal last. This possibility could result in a reduction of the size of the disposal cell.

Response: See response to similar comment above.

Comment: Too much "manager talk." The long sentences and technical terms make the document difficult to follow and obscure the meaning of these two sections.

Response: The Methodology has been revised to address this comment. The Draft-Final Methodology has been made more "user-friendly" than the previous Draft by thoroughly explaining the technical terms and defining the Decision Phase and score choices in plain language. The overall length of the Methodology has been reduced by over 50% so that it is less complicated and more "user-friendly."

Comment: Section 3 is easier to understand and is more user-friendly.

Response: The Methodology has been revised to make the entire document more user-friendly.

Comment: Page 8, third bullet. Considering alternatives only on the basis of current technology may not be a good idea. Breakthrough technology may be in the pipeline which could justify delaying activities until the technology is fielded.

Response: The Methodology has been revised to address this comment. As stated in the Introduction (Section 1) of the Draft-Final Methodology, "The OU3 ROD also recognized that recycling or reuse alternatives may become competitive with the ROD remedy (OSDF placement) in the future (due to changes in comparative costs or the availability of breakthrough technologies) and committed DOE to evaluate alternatives to OSDF placement.

Comment: Page 20. LCA needs to be spelled out in the title of the paragraph.

Response: In the revised Methodology, LCA is spelled out and discussed in Section 2.

Comment: Attachment, Page 35. Consultation with the Fernald Citizens Task Force should be mentioned in the discussion dealing with socio-economic analysis.

Response: The CTF has been, and will continue to be, consulted on all current and future applications of the entire Methodology (not only the socio-economic aspects).

Summary of Changes to the *Draft Final Decision Methodology for Fernald Material Disposition Alternatives*

The following changes were made to the *Decision Methodology for Fernald Material Disposition Alternatives* in an effort to simplify application of the methodology. Many of the changes (noted with an asterisk) were the result of stakeholder input.

- ***Added a threshold phase.*** The threshold criteria reflect DOE's commitment to incorporating certain core values, such as safety and health, in all FEMP activities. Therefore, the following three performance measures have been elevated to threshold criteria:

  1. Protectiveness of Human Health and the Environment
  2. Meets Applicable or Relevant and Appropriate Requirements (ARAR)
  3. Within 25 percent of the lowest cost alternative (Total Life Cycle Cost) * The lowest cost alternative, and any alternatives which are within 25 percent of the lowest cost alternative, will pass the threshold phase and be retained for evaluation in the Life Cycle Analysis Phase.

- ***Removed Envirocare and Nevada Test Site as disposal alternatives.*** Both disposal sites were thoroughly evaluated as part of the *Operable Unit 3 Record of Decision for Final Remedial Action.*

- ***Better defined the scoring process for subjective performance measures (local economic impacts, local social preferences, institutional preference and environmental impacts).*** DOE and EPA will now evaluate these performance measures based on technical data, and will develop definitions for ranking the measures on a constructed scale from 1 through 5 (5 is more preferable). DOE will continue to request stakeholder input on local social preferences only. This is in response to difficulties stakeholders experienced in scoring performance measures. *

- ***Standardized weighting factors for each performance measure.*** DOE took all stakeholder weights and constructed a standard weight percent based on the data for each performance measure. *

- ***Simplified and reduced the volume of the document by 50 percent so it is less complicated and more user friendly.*** *

Note: Per the *Operable Unit 3 Record of Decision for Final Remedial Action,* the selected final remedial action for the majority of OU3 radiologically contaminated material, including structural steel, is placement in the On-Site Disposal Facility.

May 6, 1997